WHAT IS CLAIMED IS:

1. A pattern inspection method which scans the inspected pattern formed on a substrate according to the design data with the laser beam and receives the light passing through said substrate with the light receiving device and, from the pattern information obtained by said light receiving device, generates the image of the inspected pattern and, for coincidence between this image and the reference data obtained by imaging of said design data, corrects said reference data to generate the reference image and compares the image of said inspected pattern and the reference image to detect any defects of the inspected pattern wherein

said reference image generation being executed by determination of the edge boundary condition showing the gray level corresponding to the pattern edge position through convolution operation of the optical point spread function corresponding to the laser beam strength and said inspected pattern image as well as detection according to said edge boundary condition of the edge position in said inspected pattern by the unit of sub-pixels.

2. A pattern inspection method which scans the inspected pattern formed on a substrate according to the design data with the laser beam and receives the light

passed through said substrate with the light receiving device and, from the pattern information obtained by said light receiving device, generates the image of the inspected pattern and, for coincidence between this image and the reference data obtained by imaging of said design data, corrects said reference data to generate the reference image and compares the image of said inspected pattern and the reference image to detect any defects of the inspected pattern wherein

said reference image generation comprising provision to each pixel of sub-pixels dividing the pixel to form a matrix and calculation of the gray level of the pixel based on the number of sub-pixels belonging to the pattern developed in each pixel and

calculation of the pattern width for said inspected pattern and for the reference data at the position at the corresponding position by treating the number obtained by dividing said gray level by the gray level step count as the width of the pattern developed in that pixel.

3. A reference image preparation method as set forth in Claim 2 wherein

the gray level of each pixel is calculated from the number of sub-pixels belonging to said inspected pattern and, treating the count obtained by dividing this gray level by the gray level step count as the

pattern width of the inspected pattern developed in the pixel, the pattern width of said inspected pattern is calculated and

the gray level of each pixel is calculated from the number of sub-pixels belonging to said reference data pattern and, treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the reference data developed in the pixel, the pattern width of said reference data is calculated.

4. A reference image preparation method as set forth in Claim 3 wherein

the pattern correction width of said reference data is calculated from the difference between the pattern width of said inspected pattern and the pattern width of the reference data.

5. A pattern inspection device comprising:

a scanning means which scans the inspected pattern formed on the substrate according to the design data with the laser beam and receives the light passing through said substrate with the light receiving device,

a photoelectric image processing means which generates the image of the inspected pattern from the pattern information obtained by the light receiving device in said scanning means,

a reference image generation means which generates the reference image with correcting said reference data so that the positions of the image of said inspected pattern and the reference data obtained by imaging of said design data coincide,

a comparison means which compares the image of said inspected pattern and the reference image to detect any defect in the inspected pattern, and

an edge position detection means which determines the edge boundary condition showing the gray level corresponding to the pattern edge position through convolution operation of the optical point spread function corresponding to the laser beam strength and the image of said inspected pattern and detects the edge position of the inspected pattern by the unit of sub-pixels according to said edge boundary condition.

6. A pattern inspection device comprising:

a scanning means which scans the inspected pattern formed on the substrate according to the design data with the laser beam and receives the light passing through said substrate with the light receiving device,

a photoelectric image processing means which generates the image of the inspected pattern from the pattern information obtained by the light receiving device in said scanning means,

a reference image generation means which

generates the reference image with correcting said reference data so that the positions of the image of said inspected pattern and the reference data obtained by imaging of said design data coincide,

a comparison means which compares the image of said inspected pattern and the reference image to detect any defect in the inspected pattern, and

a pattern width calculation means which provides each pixel with sub-pixels dividing the pixel into a matrix and calculates the gray level of each pixel based on the number of sub-pixels belonging to the pattern developed in each pixel and, with treating the count obtained by dividing this gray level by the gray level step count as the width of the pattern developed in the pixel, calculates the pattern width of said inspected pattern and the pattern width of the reference data at the corresponding position respectively.

7. A pattern inspection device as set forth in Claim 6 wherein

said pattern width calculation means

calculates the gray level of each pixel from the number of sub-pixels belonging to said inspected pattern and, with treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the inspected pattern developed in the pixel, calculate the pattern width of said inspected pattern,

and also calculates the gray level of each pixel from the number of sub-pixels belonging to the pattern of said reference data and, with treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the reference data developed in the pixel, calculates the pattern width of said reference data.

8. A pattern inspection device as set forth in Claim 7 wherein

said pattern width calculation means

calculates the pattern correction width of said reference data from the difference between the pattern width of said inspected pattern and the pattern width of the reference data.

9. A computer readable memory storing a pattern inspection program which, by controlling the computer, scans the inspected pattern formed on the substrate according to the design data with the laser beam and receives the light passing through said substrate with the light receiving device and generates the image of the inspected pattern according to the pattern information received by the light receiving device and, for coincidence of this image and the reference data position obtained by imaging of said design data, corrects said reference data to generate the reference

image and compares the image of the inspected pattern and the reference image to detect any defect in the inspected pattern wherein

said pattern inspection program executes,

in said reference image generation process,

determination of the edge boundary condition showing the gray level corresponding to the pattern edge position by convolution operation of the optical point spread function corresponding to the laser beam strength and the image of said inspected pattern and

detection of the edge position of said inspected pattern by the unit of sub-pixels according to said edge boundary condition.

10. A computer readable memory storing a pattern inspection program which, by controlling the computer, scans the inspected pattern formed on the substrate according to the design data using the laser beam, receives the light passing from said substrate with the light receiving device, generates the image of the inspected pattern based on the pattern information obtained by the light receiving device and, for position coincidence between this image and the reference data obtained by imaging of said design data, corrects said reference data and generates the reference image, and compares the image of said inspected pattern and the reference image to detect defects of the inspected

pattern wherein

said pattern inspection program executes,

in said reference image generation,

provision of sub-pixels dividing the pixel as a matrix to each pixel and calculation of the gray level for each pixel based on the number of sub-pixels belonging to the pattern developed in each pixel an

calculation of the pattern width of said inspected pattern and the pattern width of the reference data at the corresponding position respectively with treating the count obtained by dividing said gray level by the gray level step count as the width of the pattern developed in the pixel.

11. A computer readable memory storing the pattern inspection program as set forth in Claim 10 wherein

said pattern inspection program

calculates the gray level of each pixel from the number of sub-pixels belonging to said inspected pattern and, with treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the inspected pattern developed in the pixel, calculates the pattern width of said inspected pattern, and also calculates the gray level of each pixel from the number of sub-pixels belonging to the pattern of said reference data and, with treating the count obtained by dividing this gray level by the gray level

step count as the pattern width of the reference data developed in the pixel, calculates the pattern width of said reference data.

12. A computer readable memory storing the pattern inspection program as set forth in Claim 11 wherein

said pattern inspection program

calculates the pattern correction width of said reference data from the difference between the pattern width of said inspected pattern and the pattern width of the reference data.